REMARKS

This application has been carefully reviewed in light of the Office Action dated July 22, 2004. Claims 1, 6, 10, 13, 16-17, and 46-48 have been amended. Claim 14 has been canceled. Claims 1, 6-13, 16-17, and 46-48 are now pending. Applicants reserve the right to pursue the original claims and other claims in this and other applications. Applicants respectfully request reconsideration of the above-referenced application in light of the amendments and following remarks.

Claims 1-4, 6-8, 10-14, and 16-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney in view of Fong and Matijasevic. The rejection is respectfully traversed.

The cited references do not teach an atomic layer doping apparatus comprising, *inter alia*, "a first atomic layer doping region for depositing a first dopant species on a first substrate as an atomic monolayer; a second atomic layer doping region for diffusing said first dopant species in said first substrate, wherein said first and second atomic layer doping regions are chemically isolated from one another by an inert gas curtain; and a loading assembly for moving said first substrate from said first doping region through said inert gas curtain to said second doping region," as recited in claim 1 (emphasis added).

McInerney, in contrast, discloses that the wafer indexing plate 104 lifts and moves the substrate from one processing station to another. The "wafer indexing plate 104 includes a plurality of notches 162, which are used to lift a minimum overlap exclusion ring ("MOER" ring) . . . and the wafer during indexing." (Col. 4, lines 31-35). McInerney does not teach or suggest that a substrate is moved from the first doping region through an inert gas curtain to a second doping region.

Fong is relied upon for teaching a first atomic layer region used for deposition and a second atomic layer region used for driving in the dopant atoms, and adds nothing to rectify the deficiencies associated with McInerney. Matijasevic is relied upon for disclosing the use of individual heaters and also adds nothing to rectify the deficiencies associated with McInerney and Fong.

The cited references simply do not teach or suggest a loading assembly which moves a substrate from the first doping region through an inert gas curtain to a second doping region. In fact, it is impossible to do so with McInerney's disclosed apparatus. McInerney lifts the substrate and moves the substrate into another processing chamber via the wafer indexing plate 104. Claims 6-8, 10-14, and 16-17, depend from claim 1 and should be allowable along with claim 1.

Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney, Fong, Matijasevic, and in further view of Henley. The rejection is respectfully traversed.

Dependent claim 9 is allowable for at least those reasons set forth above with respect to independent claim 1. Specifically, McInerney, Fong, and Matijasevic do not teach or suggest a "loading assembly for moving said first substrate from said first doping region through said inert gas curtain to said second doping region," as recited in claim 1 (emphasis added). Henley is relied upon for teaching three deposition regions and adds nothing to correct the deficiencies found in McInerney, Fong, and Matijasevic.

Claim 46 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney in view of Fong and further in view of Gattuso. The rejection is respectfully traversed.

McInerney and Fong do not teach or suggest an atomic layer doping apparatus comprising "a first atomic layer doping region . . . a second atomic layer doping region . . . said first and second doping regions being chemically isolated from one another by an inert gas curtain, wherein said inert gas curtain is provided at a higher pressure than an atmosphere containing said first dopant species; and, a loading assembly for moving said first substrate from said first doping region to said second doping region through said inert gas curtain," as recited in claim 46 (emphasis added).

McInerney and Fong do not teach or suggest a loading assembly that moves the substrate through an inert gas curtain or that the inert gas curtain is provided at a higher pressure than the first dopant species. McInerney's apparatus employs a wafer indexing plate 104 that lifts the substrate from one region and transports it to another. It is impossible to move a substrate through an inert gas curtain with McInerney's apparatus without a major redesign of McInerney's apparatus. Gattuso is relied upon for disclosing the use of an inert gas curtain at a higher pressure than the reaction gases, and adds nothing to rectify the deficiencies associated with McInerney and Fong.

The Office Action acknowledges that "McInerney is silent on the pressure at which the inert gas is supplied." (Office Action, pg. 10). Applicants claim that "the inert gas curtain is provided at a higher pressure than an atmosphere containing said first dopant species," as recited in claim 46. There is no suggestion in McInerney to provide an inert gas curtain at a higher pressure than the first dopant species. The exhaust gas port 140 provides a way of evacuating the chambers in McInerney. The exhaust gas port 140 establishes a pressure difference by way of the exhaust gas port vacuum pump 142. Since a pressure gradient is established through annular gaps 126a and 128a by vacuum pump 142, there is no reason or motivation to provide McInerney's inert gas with a higher pressure than the first dopant species.

To establish a *prima facie* case of obviousness, three requirements must be met: (1) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine reference teachings; (2) a reasonable expectation of success; and (3) the prior art reference (or references when combined) must teach or suggest all the claim limitations. More importantly, the teaching or suggestion to make the claimed combination and the reasonable expectation for success must both be found in the prior art and not based on the Applicants' disclosure. See, e.g., In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

In this case, there is no disclosure in the cited references to combine Gattuso's inert gas curtain having a higher pressure with McInerney's inert gas, when McInerney already provides a pressure gradient established by vacuum pump 142. The only reason it seems obvious to the Examiner is in light of Applicants' disclosure. The cited references do not teach or suggest that "the inert gas curtain is provided at a higher pressure than an atmosphere containing said first dopant species," as recited in claim 46 (emphasis added).

Claim 47 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney in view of Fong, Gattuso, and to Hartig. The rejection is respectfully traversed.

McInerney, Fong, and Gattuso do not teach or suggest "a first atomic layer doping region for depositing a first dopant gas species . . . said first dopant gas species exhausted through a first gas port; a second atomic layer doping region . . . said first and second doping regions being chemically isolated from one another by an inert gas curtain provided at a higher pressure than an atmosphere containing said first dopant gas species, wherein said non-reactive gas species is exhausted through a second gas

port; and a loading assembly for moving said first substrate from said first doping region to said second doping region through said inert gas curtain," as recited in claim 47 (emphasis added).

McInerney, Fong, and Gattuso do not teach or suggest a first atomic doping layer region with a first gas port and a second atomic doping layer region with a second gas port. Further, neither references teach alone, or in combination, that the first and second atomic doping regions are separated by an inert gas curtain provided at a higher pressure than said first dopant gas species. Further still, the references do not teach or suggest moving a substrate through an inert gas curtain. Hartig is relied upon the use of separate gas exhausts for each chamber, and adds nothing to rectify the deficiencies of McInerney, Fong, and Gattuso.

The Office Action asserts that Hartig provides motivation to combine for purpose of "aspirating gas from each chamber and further preventing gas transfer between the individual chambers." (Office Action, pg. 8). However, "[t]he mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01 (emphasis added). In this situation, McInerney clearly discloses only one exhaust port 140. Additional exhaust ports to McInerney's structure would require major redesign and reconstruction of the apparatus.

It is not proper to combine references where doing so "would require a substantial reconstruction and redesign of the elements shown in [the primary reference, i.e., McInerney] as well as a change in the basic principle under which the [primary reference, i.e., McInerney] construction was designed to operate." In re Ratti, 270 F.2d 810, 813, 123 U.S.P.Q. 349, 352 (C.C.P.A. 1959). This is well settled Office policy. See M.P.E.P. § 2143.01, page 2100-127 (Feb. 2003).

McInerney's apparatus would undergo a major redesign and reconstruction of the elements disclosed, if a separate exhaust port is added to each chamber. Each chamber in FIG. 3 would have to be redesigned to accommodate each exhaust port. McInerney's FIG. 3 illustrates that annular gaps 128a and 126a separate the chambers C and D. Again, Applicants submit that the only reason to employ separate exhaust ports is gleaned from Applicants' disclosure.

The teaching or suggestion to make the claimed combination and the reasonable expectation for success must both be found in the prior art and not based on the Applicants' disclosure. See, e.g., In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). In this case, since the primary reference discloses only one exhaust port, there is no motivation to use Hartig's exhaust ports since McInerney's single vacuum port 142 aspirates the gas in each chamber C and D through annular gaps 128a and 126a.

Claim 48 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over McInerney, Fong, Matijasevic, and to Straemke. The rejection is respectfully traversed.

Claim 48 recites "a first atomic layer doping region comprising a susceptor and a heater assembly . . . a second atomic layer doping region comprising a susceptor and a heater assembly . . . wherein said first and second atomic layer doping regions are isolated from one another by a physical barrier having a closeable opening; and a loading assembly for moving said first substrate from said first doping region to said second doping region through said closeable opening of said physical barrier."

McInerney, Fong, and Matijasevic do not teach or suggest moving a substrate through a physical barrier. Hartig is relied upon the use of separate gas exhausts for each chamber. The Office Action cites Straemke for teaching a gas tight door separating reaction chambers. However, "[t]he mere fact that references can be combined or

modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01 (emphasis added). In this situation, there is no teaching or suggestion for employing a physical barrier having a closeable opening in McInerney.

The reactive gases in McInerney "are drawn down into respective wells 126 and 128, via annular gaps 126a and 128a, and have little opportunity to migrate toward another pedestal." (Col. 5, lines 37-41) (emphasis added). "The narrow annular gaps permit little or no recirculation of the reactive gases once the gases are drawn into the wells." (Col. 2, lines 9-11). Thus, the presence of a physical barrier having a closeable opening nullifies the importance of annular gaps 126a and 128a. Further, the presence of the annular gaps effectively isolate the adjacent chambers. There is no motivation to modify McInerney and obtain Applicants' claimed physical barrier having a closeable opening, in the atomic layer doping apparatus recited in claim 48.

Moreover, it is not proper to combine references where doing so "would require a substantial reconstruction and redesign of the elements shown in [the primary reference, i.e., McInerney] as well as a change in the basic principle under which the [primary reference, i.e., McInerney] construction was designed to operate." In re Ratti, 270 F.2d 810, 813, 123 U.S.P.Q. 349, 352 (C.C.P.A. 1959). This is well settled Office policy. See M.P.E.P. § 2143.01, page 2100-127 (Feb. 2003).

The "modification" proposed by the Examiner, in the rejection of claim 48, would require a substantial reconstruction and redesign of McInerney's apparatus. In this case, McInerney already discloses that inert gas is provided to separate chamber C from chamber D (FIG. 3) through annular gaps. McInerney's structure would have to be redesigned to accommodate a physical barrier having a closeable opening.

Moreover, since McInerney discloses lifting the substrate from one chamber to another, there would be no motivation to even have a physical barrier with a closeable opening. If anything, McInerney would simply use a physical barrier and not one with a closeable opening since the substrate in McInerney is lifted from one region to another. By contrast, Applicants claim moving the substrate from one doping region to another through the closeable opening in the physical barrier. The only reason it seems obvious to combine Straemke with McInerney is gleaned from Applicants' disclosure.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

By

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